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REMARKS/ARGUMENTS

In reply to the Final Office Action mailed July 6, 2004, Applicants respectfully request reconsideration and allowance of the subject application. In the Office Action, the Examiner finally rejected claims 1-20 under 35 U.S.C. §103(a) as being obvious over U.S. Patent 5,565,020 (the "Niewiedzial patent") in view of U.S. Patent 2,039,692 (the "van Tongeren patent") or U.S. Patent 4,634,456 (the "Syred patent"). In reply, Applicants' representative interviewed the Examiner over the telephone on August 10, 2004. Applicants would like to express their gratitude to the Examiner for extending the courtesy of discussing the subject application with Applicants' representative. These remarks will detail what was discussed in the interview.

In the section "Response to Arguments" in the Final Office Action, the Examiner construed Applicants' argument in the Remarks for Amendment "A" to be that the swirl of gas and particles induced by the swirl arms of the Niewiedzial patent cannot maintain a swirl in the gas recovery conduit. Applicants respectfully submit that the previous remarks did not contend that the gas and particles could not swirl in the gas recovery conduit of the Niewiedzial patent. Applicants, however, contended that it was not definitively known in the prior art and not contemplated by the Niewiedzial patent that the swirling mixture continues to swirl after it leaves the separation vessel 11 and ascends through the gas recovery conduit 18. Even if some swirling in the gas recovery conduit 18 was suspected, it was not known that the swirling in the gas recovery conduit is significant. In an operating FCC unit, Applicants learned that an unacceptable amount of catalyst was being lost by exiting with the product vapors. Upon investigation, Applicants discovered erosion marks on parts of the cyclone indicating a non-uniform flow pattern. Further investigation revealed that the catalyst and gaseous mixture does continue to swirl up the gas recovery conduit. The degree of swirling was unanticipated. Before this investigation, the mixture of gas and catalyst was induced to swirl in the cyclone in the same direction as it was induced to swirl upon exiting from the reaction conduit. When it was realized that the mixture of gas and catalyst continues to swirl up to the entry into the cyclones, it was realized that the gas and catalyst was directed into the cyclones toward the center of the cyclone where a product gas outlet (reference 24 in the Niewiedzial patent) is located. Once the problem of swirling gas in catalyst entering the cyclone and veering toward the center of the cyclone was discovered, then Applicants invented the solution of inducing the mixture of catalyst and gases to swirl in opposite angular directions in the cyclone and from the exit from the reaction conduit.

The Examiner acknowledges that the Niewiedzial patent does not disclose opposite angular directions of the mixture of gases and catalyst in the cyclone and from the exit from the reactor conduit, but contends that the van Tongeren patent discloses this arrangement. Figure 8 of the van Tongeren patent shows that the primary cyclone casing 9 and the shunt-current-cyclone 48 are adjoined to each other in such a way that they must be configured to induce swirling in opposite angular directions or no swirling will occur in the shunt-current-cyclone 48. The van Tongeren patent does not indicate that this arrangement has any advantage over an arrangement where the mixtures swirl in the same angular

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direction in both cyclones 9 and 48. The van Tongeren patent merely states that "[t]his collector has the same efficiency as a very large direct-type cyclone and a lower resistance." Page 2, column 2, lines 34-36. However, this does not provide motivation to change the arrangement in the Niewiedzial patent because the van Tongeren patent does not indicate whether the "very large direct-type cyclone" has a different or same angular direction of swirl than in the primary cyclone casing 9. Moreover, the device of the van Tongeren patent necessarily forces swirling in primary cyclone casing 9 before entering the shunt-current-cyclone 48. If one of ordinary skill in the art was not aware of the significant swirling of gas and solids before entry into the cyclone of the Niewiedzial patent, he would not know that the device of the van Tongeren patent would be applicable to the design of the Niewiedzial patent.

Applicants respectfully submit that the van Tongeren patent is not analogous art to the claimed invention. In *In re Oetiker*, 24 USPQ 2d 1443, 1445 (Fed.Cir.1992), the Court indicated that "a prior art reference must either be in the field of Applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which Applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention." Applicants respectfully submit that the van Tongeren patent which deals with dust removal is not in the field of Applicants' endeavor which involves removal of larger catalyst particles from a stream of gaseous hydrocarbons at elevated temperature. Moreover, Applicants respectfully submit that the van Tongeren patent is not reasonably pertinent to the particular problem with which Applicants were concerned. Those of ordinary skill in the art were not even aware of Applicants' problem of significant gas and catalyst continuing to swirl upon entry into the cyclone of the FCC unit. The problem the van Tongeren patent addresses is the separation of dust from air and accounting for double eddy-currents that are swirling about a horizontal axis as well as around a vertical axis. See van Tongeren patent, page 1, col. 1, lines 17-33. Hence, the van Tongeren patent teaches the use of a U-shaped skimming place 10. *Id.* at page 1, col. 2, lines 49-55 and page 2, col. 2, lines 33-34. However, the van Tongeren patent does not indicate that swirling the mixture in opposite angular directions in succeeding cyclones is any better than swirling in the same angular direction in succeeding cyclones. Accordingly, Applicants respectfully submit that the van Tongeren patent does not pertain to the problem Applicants sought to address.

The same arguments directed to the van Tongeren patent may also be applied to the Syred patent. Moreover, Applicants' representative also pointed out in the interview that there would be an additional reason that one would not be motivated to modify the Niewiedzial patent by the teachings of the Syred patent. The Syred patent is not analogous to the FCC art because the Syred patent is directed toward grading solid particles. The Syred patent is designed to admit only a certain size of particles into the secondary vortex. Thus, particles of the desired size are purposely admitted into the secondary vortex and the particles that do not meet that size requirement are purposely rejected. However, in the FCC art, no catalyst particles are purposely admitted into a secondary cyclone because the objective is to obtain a gas stream that is virtually free of particles. Hence, one of ordinary skill in the art would not be motivated by the teachings of the Syred patent, which is

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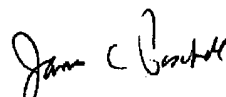
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directed to purposely keeping particles in the gas outlet stream, to modify the teachings of the Niewiedzial patent.

Even assuming arguendo, that the van Tongeren and Syred patents were analogous art and there were motivations to combine the references with the primary Niewiedzial patent, which Applicants respectfully deny, the results achieved by the invention are unexpectedly superior. The example beginning on page 16 of the subject application indicates that CFD modeling used to examine the prior art arrangement and the arrangement of the present invention reveals that when the cyclone induced swirling in the same direction as the outlet from the reactor conduit, 21% of the mixture entering the cyclone veered toward the center of the cyclone where the product gases exit instead of joining the vortex on the periphery of the cyclone to further separate the gases from the solids. However, in the arrangement of the present invention with the mixtures swirling in different angular directions in the cyclone and from the exit from the reactor conduit, only 10% of the mixture entering the cyclone veered toward the center where the gas outlet is disposed without veering toward the vortex for further separation. The present invention therefore accounts for over a 50% increase in efficiency in terms of veering toward the center of the cyclone. This 50% increase in efficiency was clearly unexpected in light of the unanticipated significance of swirling upon entry into the cyclone. The claimed invention solved the problem with non-uniform flow in the operating FCC unit originally investigated.

Applicants respectfully submit that claims 1-20 in the subject application are not obvious over the cited references. Accordingly, Applicants respectfully request reconsideration and allowance of all the claims pending in the subject application. Should the Examiner have any concerns regarding this application, please feel free to call the undersigned.

Respectfully submitted,



James C. Paschall
Attorney for Applicants
Reg. No. 36,887
(847) 391-2355 (phone)
(847) 391-2387 (fax)

James W. Hellwege
Registration No. 28,808
Washington Counsel (703) 205-8021
JCP/gm